

Environmental accounts on environmental protection expenditure (EPE) QMI

Quality and Methodology Information for environmental protection expenditure statistics, detailing the strengths and limitations of the data, methods used and data uses and users.

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1 . Methodology background

National Statistic	
Frequency	Annual
How compiled	Various sources
Geographic coverage	UK
Last revised	4 October 2019

2 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the [European Statistical System five dimensions of quality \(PDF, 3MB\)](#)) as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about the existing uses and users of the data
- understand the methods used to create the data
- help you to decide suitable uses for the data
- reduce the risk of misusing data

3 . Important points

This report aims to provide users of the environmental protection expenditure (EPE) statistics with information on the usability and fitness for purpose of these estimates.

The EPE statistics form part of the Office for National Statistics (ONS) Environmental Accounts. This is part of a set of documents covering the UK Environmental Accounts estimates.

There is quality and methodology information available for other UK Environmental Accounts estimates, including:

- [Air emissions](#)
- [Energy use](#)
- [Material flows](#)
- [Environmental goods and services](#)
- [Environmental taxes](#)

4 . Quality summary

Overview

The aim of the environmental protection expenditure (EPE) accounts is to estimate the amount economic resources devoted to all activities that have the prevention, reduction and elimination of pollution and of any other degradation of the environment as their main purpose. Measuring the financial commitment of an economy to environmental protection helps us to evaluate how environmental protection costs influence international competitiveness, to assess the application of the polluter pays principle, and the cost-effectiveness of environmental control mechanisms.

The EPE accounts form part of the environmental accounts, which are defined within the UN System of Environmental-Economic Accounting ([SEEA](#)). The SEEA is the internationally agreed standard for concepts, definitions, classifications, accounting rules and tables for producing accounts on the environment and its relationship with the economy. The SEEA uses concepts, definitions and classifications consistent with the UN System of National Accounts; this enables comparisons of the results of the environmental-economic accounts with the aggregates of the national accounts.

A range of EPE statistics is published and available to download from the ONS UK Environmental Accounts publication and accompanying datasets:

- Environmental protection expenditure by industry
- Environmental protection expenditure by general government¹
- Environmental protection expenditure: total²

Along with reporting EPE estimates within the UK [Environmental Accounts publication](#), the reporting of total UK EPE is a mandatory Eurostat requirement from 2017.

The annual [Environmental Protection Expenditure Survey](#) is used to provide estimates of EPE by industry.

The main data source for EPE by general government is estimates of the [annual expenditure of general government](#), which are available broken down by [Classification of the functions of government](#) (COFOG). This and further information available from the UK National Accounts [Blue Book](#) is used in the calculation of total UK EPE.

This quality and methodology report will primarily focus on the EPE Survey, but also broadly covers the sources of data required to calculate total UK EPE.

Users and uses

(Who is using the data and for what purposes.)

In addition to the mandatory requirement to supply data to Eurostat, the potential uses for data come from a variety of international organisations, UK and other governments, and the research community.

Environmental protection expenditure data can be used by policymakers to assess the environmental impact of economic activities (resource consumption, air or water pollution and waste production) and to assess the actions (investments, technologies and expenditure) that are taken to limit the causes and risks of pollution.

Notes for: Quality summary

1. General government consists of both central and local government.
2. Total EPE includes expenditure by general government, industry, non-profit institutions serving households (for example, charities, trade unions and religious societies) and households.

5 . Quality characteristics of the EPE data

Geography

Estimates of total environmental protection expenditure (EPE) and EPE by general government and industry are available at a UK level and not further disaggregated by geography.

Coherence and comparability

Estimates of total EPE and EPE by industry and general government are comparable over time. However, the time series is subject to revision if there are methodological improvements, changes to reporting requirements or data revisions from suppliers.

It should be noted that the EPE Survey, used to provide EPE by industry estimates migrated from the Department for Environment, Food and Rural Affairs (Defra) to the Office for National Statistics (ONS) in 2015.

Prior to 2015, data were collected by a Defra survey in 1994 (pilot), 1997, and then annually between 1999 and 2013. Defra has published [the results for these years](#). In 2016, the survey was migrated to the ONS and was despatched in September 2016 to collect data for 2015. As a result of the migration no data were collected for 2014. Results from the EPE Survey from 2015 onwards are not comparable with previous data because of differences in the methodology between Defra and the ONS.

Specific differences include:

- the 2013 EPE commissioned by Defra sampled 1,166 companies and had a response rate of 21%; in contrast, the 2017 EPE Survey despatched by the ONS sampled around 3,000 businesses and achieved a response rate of 74%
- a number of questions were removed when the survey migrated to the ONS, in addition the layout and wording of the form was changed

In 2016, a question was added to the ONS EPE Survey to obtain estimates of external operational expenditure. Before this, information was collected only on in-house operational expenditure (please see [Annex 1](#) for definitions). From 2016, the survey collected information on the profits from the disposals of any capital assets that had been used for environmental protection purposes.

Time series of data are available as follows:

- [EPE by general government](#)
- [EPE by industry](#)
- [Total EPE](#)

Timeliness and punctuality

The ONS aims to publish total EPE and EPE by general government and industry two years after the reference period. For example in 2019, 2017 data are published. The ONS aims to publish the data in the most timely manner available. Total EPE estimates are supplied to Eurostat each year in line with regulatory requirements (currently by the end of December). Eurostat then releases the estimates in their [EPE database](#) alongside data for other countries. [Annex 2](#) has definitions of available breakdowns of total EPE published by Eurostat.

For more details on related releases, the [ONS release calendar](#) is available online and provides 12 months' advance notice of release dates. If there are any changes to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the [Code of Practice for Statistics](#).

Concepts and definitions

The United Nations (UN) [System of Environmental-Economic Accounting](#), together with the UN System of National Accounts and the [European System of Accounts \(ESA\)](#), provides a framework for producing internationally comparable statistics on the environment and its relationship with the economy. The ONS is responsible for reporting the information to Eurostat on an annual basis. EPE information is reported broken down by [Classification of Environmental Protection Expenditure \(CEPA\) classification](#).

EPE supports understanding of society's response to the challenge of environmental degradation and depletion of natural resources, and the potential for economic activity to be based on environmentally friendly activities.

It is important to note that a low level of EPE does not necessarily mean that a country's government or industries are not effectively protecting the environment. If investment has been previously made in equipment that reduces or cleans waste products, then the cost of maintenance of these will be small compared with the cost of introducing new equipment.

Where investment has been made in equipment that is integrated within a production process, only the additional cost over and above equivalent but less environmentally friendly equipment is included in the estimates provided. By contrast, the total cost of any equipment that is not integrated into a production process is included in the estimates. This means that if governments or industries have more focus on reducing and cleaning pollution as part of their production process, their expenditure is likely to be less than for those that do not change their production processes and instead focus on cleaning the pollution produced by them.

6 . Methods used to produce the EPE data

The environmental protection expenditure (EPE) is the data source used to provide estimates of EPE by industry. This section will primarily focus on the EPE Survey but will also briefly cover the data sources used for estimating EPE by general government and total EPE.

The EPE Survey was designed to collect information on how much industries spend on protecting the environment. The EPE Survey focuses on five types of expenditure (please see [Annex 1](#) for detailed definitions):

- external operating expenditure
- in-house operating expenditure
- end of pipe capital expenditure
- integrated capital expenditure
- disposals

The target population for the survey is specified by [Eurostat](#)¹ as including the following industries:

- mining and quarrying (B)
- manufacturing (C)
- electricity, gas, steam and air conditioning supply (D)
- water collection (E36)

For more information on industry classification please see the current [Standard Industrial Classification \(SIC\)](#) used in classifying businesses and other statistical units.

Paper questionnaires are sent to the approximately 3,000 UK businesses that are selected using the Inter-Departmental Business Register (IDBR) as the sample frame. The design is a stratified single-stage random sample with the target population being stratified by industry and employment size. Sample selection occurs independently within each stratum.

All businesses with 250 employees or above are selected, together with a random sample of businesses from each of the other strata, defined by two-digit SIC 2007 industry, and employment size band.

All responses that fail edit rules are investigated and queried with the respondent to validate the responses and obtain explanations for data anomalies. Sources such as IDBR and business websites are also used to investigate data. Various quality assurance exercises, such as validating nil returns via telephone calls directly with the businesses, are also carried out.

Non-response can lead to a reduction in the precision of estimates and undermine the data's utility for users. Unit (total) non-response is dealt with via weighting; first estimates are produced with a minimum response rate of 70%. Item (partial) non-response is dealt with through imputations.

Imputation methods are based fundamentally on other survey variables that serve to predict the values or distribution of plausible values of the target variable(s) being imputed (the imputation classifications). Typically, the imputation classifications will consist of other variables from the survey that have two fundamental properties: they should account for any non-response bias identified in the data, and they should be good predictors of the target variable(s). Poorly specified classifications will lead to error or bias in survey estimates.

Businesses that have provided valid responses are divided into imputation classes and the median value for the complete and valid returns in the imputation class is calculated. This value is used to replace the missing value for the businesses that have not provided valid responses within the class.

It is important that the imputation class has enough responders' complete returns to enable to imputation calculations to give a fair result. Otherwise, one very large or small response could have a big impact on the quality of the imputed values. An imputation class has to hold at least 10 responders that have provided complete returns. Where this is not the case the next priority order class would be applied.

Sample respondents are weighted to represent a number of non-sampled businesses within the same stratum. The expansion estimator, also known as the Horvitz-Thompson estimator, is used to estimate total expenditure on environmental protection. Expansion estimation accounts for the survey design via the probabilities of selection. The sample total is expanded up to the size of the population by multiplying the sample total by the ratio of the number of businesses in the population divided by the number of businesses within the sample. The resulting weighted responses are then aggregated.

Disclosure control

The [Statistical Disclosure Control Policy](#) sets out the standards for safeguarding the information provided in confidence to us. "Disclosure control" refers to the methods that reduce the risk of confidential information being published in any official statistics. These methods are applied if ethical, practical or legal considerations require the data to be protected. Disclosure control involves modifying data so that the risk of identifying individuals is reduced, but at the same time attempts to find a balance between improving confidentiality protection and maintaining an acceptable level of quality in the published data.

Accuracy

As in all surveys, the estimates in the EPE Survey are subject to various sources of error. The total error in a survey estimate is the difference between the estimate derived from the data collected and the true (unknown) value for the population. The total error consists of two main elements; the sampling error and the non-sampling error. The EPE Survey was designed to minimise both these errors.

Sampling error

This occurs because estimates are based on a sample rather than a census of the population. The results obtained for any single sample may, by chance, vary from the true values of the population but the variation would be expected to be zero on average over a number of repeats of the survey. Sampling error is minimised through the use of a stratified random sample.

Non-sampling error

There is potential for non-sampling error which cannot be easily quantified. These can be caused by coverage issues, measurement and non-response. Steps are taken to minimise non-sampling error. For example, returned information is run through a series of validation checks to identify any errors. Data that fail the validation checks are queried with respondents to confirm or correct the original data. Following dispatch of the questionnaire, up to two reminders are sent to businesses that have not responded. Response-chasing exercises are also carried out to increase the response rate.

[Standard errors² and 95% confidence intervals³](#) for EPE Survey estimates are available.

Revisions to previous data may occur. Revisions are not uncommon during the first few years of a survey being conducted. In addition, as the EPE accounts use data from third parties that may also revise their data, these figures will be updated yearly. Reasons for revisions include:

- the incorporation of additional data received from businesses who have been sampled in multiple years of the survey
- changes to data as a result of businesses revising their previous submissions
- developments in methodology and changes to the questionnaire

Because of the variety of data sources used in the production of the total EPE accounts it is not possible to produce statistical measures of accuracy, such as variances and confidence intervals associated with them. The data sources used for the total EPE accounts are [National Accounts Blue Book](#), [National Accounts supply and use tables](#), [EPE Survey data](#), [Annual expenditure of general government](#) and the [Annual Business Survey](#). These data sources are published by the ONS and are designated as official statistics. This means that the statistics are compliant with the Code of Practice for Statistics and are considered to be high quality.

Notes for: Methods used to produce the EPE data

1. See page 29 of the [Environmental Protection Expenditure handbook](#) for more details.
2. Standard errors are widely-used measures of the accuracy of survey estimates. They describe sampling variability – the variability in estimates caused by the fact that we have taken a sample of a population rather than a census.
3. A 95% confidence interval is a range within which the true population would fall for 95% of the times the survey was repeated. It is a standard way of expressing the statistical accuracy of a survey-based estimates. If an estimate has a high error level, the corresponding confidence interval will be very wide.

7 . Other information

More information on environmental protection expenditure (EPE) and topics related to UK Environmental Accounts is available:

[UN System of Environmental-Economic Accounting](#)

[UK Environmental Accounts](#)

[Eurostat manual for EPE](#)

[Eurostat EPE estimates](#)

[Classification of Environmental Protection Activities information](#)

8 . Annex 1: Types of expenditure captured by the EPE Survey

The EPE Survey focuses on five types of expenditure.

External operating expenditure

This refers to operating costs paid to external organisations for treatment, disposal or investigation relating to waste water management, protection of ambient air and climate, and solid waste management. All other potential types of environmental protection expenditure are captured within the "other" category and may include expenditure aimed at the protection of soil or groundwater, noise abatement, protection of biodiversity or protection against radiation.

In-house operating expenditure

This refers to on-site management costs for the treatment, disposal or investigation relating to waste water management, protection of ambient air and climate and solid waste management. All other potential types of environmental protection expenditure are captured within the "other" category and may include expenditure aimed at the protection of soil or groundwater, noise abatement, protection of biodiversity or protection against radiation.

End of pipe capital expenditure

This refers to capital expenditure for methods, technologies, processes or equipment designed to collect, remove pollution and pollutants after their creation. This might include investment in plants or equipment that treat generated pollutants, such as an effluent treatment plant or exhaust air scrubbing system, or investment in ensuring their safe disposal, such as a solid waste compactor.

Integrated capex

This refers to investment in methods, technologies and equipment that are integrated within the businesses' overall activity, where the primary aim of the expenditure is to reduce any pollutants generated. The expenditure captured here includes only the element that specifically relates to the additional cost of the environmentally friendly process compared with a cheaper and less environmentally friendly alternative. An example here would be the difference in the cost to a business of purchasing more precise cutting machinery, that led to the production of smaller amounts of waste, compared with the business purchasing cheaper but less precise cutting machinery that might lead to the production of larger amounts of waste.

Disposals

This refers to profits from the disposal of any capital assets that have been used for environmental protection purposes.

9 . Annex 2: Breakdowns of total environmental protection expenditure (EPE) published by Eurostat

Total environmental protection expenditure (EPE) accounts are compiled in line with Eurostat regulations, more detailed information can be found in the [EPE Handbook 2017](#).

Total EPE accounts for the UK and other European countries are available broken down by the following economic units:

- general government and non-profit institutions service households (NPISH)
- corporations as specialist and secondary producers of market EP services.
- corporations (other)
- total supply of environmental protection services
- households
- transfers

General government and NPISH

European System of Accounts 2010 (ESA 2010) defines the general government sector as the grouping of institutional units which are non-market producers. They provide goods and services to other economic units for free or at prices that are not economically significant (that is, prices that cover less than 50% of the production costs).

The NPISH sector consists of non-profit institutions that are separate legal entities, which serve households and are private non-market producers. However, at present NPISH data are not included.

These estimates are produced by applying the market or non-market output split from the general government production account in Blue Book to the final consumption expenditure of the environmental protection division in the annual expenditure of general government tables (ESA Table 11).

Corporations as specialist and secondary producers of market environmental protection (EP) services

A specialist EP producer is a business whose primary activity is the production of EP services. Specialist EP producers are mainly found in Standard Industrial Classification (SIC) 37 (sewerage), 38.1 (waste collection), 38.2 (waste treatment and disposal) and 39 (remediation activities and other waste management services).

These estimates are derived from output information from the supply and use tables, supplemented by the Annual Business Survey (ABS) which provides an additional level of information.

Corporations (other)

"Other corporations" covers secondary producers (businesses who produce EP services as a secondary activity) and ancillary EP producers (businesses who produce EP services but consume the outputs themselves and do not sell them to other economic units).

This table uses the EPE Survey to collect the information required.

Households

This covers households in their capacity of consumers. Transactions of the household sector recorded in the EPE accounts are the final consumption of EP services and transfers for environmental protection received.

This information comes directly from the supply and use tables for SIC 37 (sewerage) and 38 (waste collection, treatment and disposal activities; materials recovery).

Transfers

Transactions recorded for the rest of the world sector in the EPE accounts are the imports and exports of environmental protection services and environmental protection transfers received and paid.

This information comes from the annual expenditure of general government tables ([ESA Table 11](#)).

Total supply of environmental protection services

This section captures characteristics needed to calculate the supply of EP services at purchasers' prices, specifically imports and exports of EP services as well as Value Added Tax (VAT) and other taxes minus subsidies on EP services.

These estimates are derived from a combination of data from the ABS and supply and use tables. Specifically, ABS data are used to estimate the proportion of SIC 38 (waste collection, treatment and disposal activities; materials recovery) accounted for by recycling (38.3) as this is out of scope of EPE and needs to be excluded from the estimates.